



Astronomy at the University of Canterbury Department of Physics and Astronomy and Mt John University Observatory — annual report 2001

Director: Prof. J.B. Hearnshaw

Report for the period 1 January 2001 to 31 December 2001

1. Staff

The astronomy group was saddened to learn of the sudden death of Garry Nankivell in Lower Hutt in December. Garry had collaborated with Canterbury astronomers for more than a quarter century on many of the instruments at Mt John, and he was responsible for the fabrication of the optics, notably for the 1-metre McLellan telescope and the Hercules spectrograph.

Assoc. Prof. Peter Cottrell continued as Head of Department in 2001 until the end of November, Prof. John Hearnshaw continued as Mt John director and Alan Gilmore as Mt John superintendent. Cottrell also continued to serve as a council member of the Astronomical Society of Australia, on the organizing committee of IAU Commission 27 (variable stars) and as a director on the Southern African Large Telescope Board. Saskia Besier continued as a temporary lectureship in astronomy in 2001. Cottrell served until June as chairperson of the RSNZ Committee on Astronomical Sciences, and thereafter as a member of this committee. Hearnshaw took over as chairperson from July.

Dr Karen Pollard and Dr Michael Albrow each took up tenured half-time lectureships in astronomy in July, returning to Canterbury from positions respectively at Gettysburg College in Pennsylvania and the Space Telescope Science Institute in Baltimore. Dr William Tobin continued his half-time lectureship in the first half of 2001 and resided in France for the remainder of the year. Dr Ian Bond worked as a Marsden-funded postdoctoral fellow attached to the MOA project (see section 9) throughout 2001, and

was located at Mt John. Dr Jovan Skuljan was also a MOA project postdoctoral fellow until April, but in May he took up a new postdoctoral fellowship with University of Canterbury funding and worked on precise radial velocities with the Hercules spectrograph.

Hearnshaw continued on the Board of IAU Div IX and on the IAU Advance Program Development working group during the year. Pam Kilmartin continued as chair of the IAU Committee for Small-body Nomenclature. Hearnshaw was an invited lecturer at the Te Papa Museum of New Zealand in August, where he gave a public lecture on Time and Evolution in the Cosmos. Hearnshaw visited the Lick Observatory and the Chabot Space and Science Center in Oakland California in October.

Cottrell was awarded an Erskine Fellowship from the University of Canterbury and travelled extensively in Europe and Canada from July to September, visiting 18 institutions and giving 14 seminars. He was involved in discussions about SALT, and the high resolution spectrograph that Canterbury is proposing to build for SALT. He visited all six members of the United Kingdom SALT Consortium, the Georg-August University Göttingen and the Nicolas Copernicus Astronomical Center (NCAC) in Warsaw and Torun, which are the other European members of SALT. Visits were also made to Oxford University, the Technische Universität Berlin, the Technische Universität Munich, the University of Toronto and the University of Western Ontario.

Stephen Barlow, who does technical maintenance in the areas of computing, electronics and detectors at Mt John, spent six weeks from early September on secondment to Mt Stromlo Observatory of the Australian National University in Canberra. He used this work experience to learn more about astronomical detectors and telescope control systems.

2. Students

The following students continued throughout the year with their Ph.D. research: Stuart Barnes (Hercules spectrograph, supervisor Hearnshaw); Jennifer McSaveney (RV Tau, W Vir and BL Her stars, supervisors Cottrell and Pollard); Orlon Petterson (binary Cepheids, supervisors Cottrell and Albrow), Glenn Bayne (eclipsing binaries in the Magellanic Clouds, supervisors Tobin, Bond, Besier and Pollard); Daniel Pooley (AGB stars, supervisors Cottrell, Albrow and Pollard); David Ramm (masses of visual binary stars from precise radial velocities, supervisors Hearnshaw and J. Skuljan). Dane Kent commenced his PhD research in March on a search for extrasolar planets (supervisors Hearnshaw and J. Skuljan).

Ljiljana Skuljan completed her PhD thesis on RCB stars (supervisor Cottrell) and she graduated with her doctorate in December.

McSaveney was awarded the Dennis William Moore Scholarship in astronomy and she also was awarded a Zonta Amelia Earhart Fellowship. Ramm continued as an FRST

Bright Futures Scholar. Barnes spent 3 months from June working on the optical design of the SALT high resolution spectrograph. Petterson spent six months over the winter at Mt John as an observer for the MOA project.

Ceridwen Livingston commenced her MSc thesis on the light curves of 20 novae (supervisor Hearnshaw) in March, and Malcolm Cropp commenced his MSc thesis on spectroscopy of delta Scuti stars (supervisors Pollard and Skuljan) in July. Andrew Rakich (supervisors Norman Rumsey, Hearnshaw and Tobin) completed his MSc thesis on three-mirror anastigmats in March and obtained his degree with distinction. James Yan Tse (supervisor Hearnshaw) completed his MSc thesis on the light curve and spectra of Nova Velorum 1999 in March and obtained his degree.

Liz Wylie, a 3rd year astronomy undergraduate, was awarded a summer scholarship by the Australian National University to spend the summer months from the end of 2001 at Mt Stromlo Observatory, Canberra.

3. Visitors

Dr Joyce Guzik from the Los Alamos National Laboratory in New Mexico was an Erskine Fellow in the astronomy group from early February to early April. She gave a course of lectures (ASTR323) on stellar structure and evolution to third-year undergraduates, an evening course on the Sun and helioseismology to Continuing Education students, and departmental seminars on helioseismology and gamma Doradus stars.

Dr Steve Edberg, an outreach team leader for NASA's Cassini mission, visited the department in April. He gave a seminar on solar system exploration and he also gave the Carter memorial lecture (a public lecture at Christchurch Girls' High School) on the Cassini mission.

Dr Orsola De Marco (American Museum of Natural History, New York) visited the department in December and gave a seminar on Wolf-Rayet stars.

Dr Denis Sullivan (Victoria Univ. Wellington) visited Mt John on two occasions, in March-April and in September to observe pulsating white dwarf stars with the 3-channel photoelectric photometer on the 1-m McLellan telescope.

Dr Ian Griffin (Space Telescope Science Institute, Baltimore) and Nigel Brady (Univ. Auckland) visited Mt John in July to make CCD astrometric and photometric observations of near-Earth asteroids on the McLellan telescope. Griffin gave a seminar in July on the HST public outreach program, which he directs.

4. Conferences

Five members of the Canterbury astronomy group attended the RASNZ 2001 annual conference at Alexandra Park in Auckland in July. They were Hearnshaw, Tobin, Gilmore, Kilmartin and Petterson. Talks presented were as follows: Hearnshaw on the Hercules spectrograph, on New Zealand's participation in the SALT project and on "Time and evolution in the cosmos"; Tobin on Foucault's pendulum and on the MOA catalogue of eclipsing binaries in the SMC; Gilmore on Mt John photometry of Nova Puppis 2000 and Petterson on the masses of binary Cepheids as a test of stellar evolution theory.

Cottrell and McSaveney attended a workshop on pulsating B and A stars in Brussels in July. They also participated at IAU Colloquium 185 on radial and non-radial stellar pulsation in July in Leuven, Belgium, where they presented a poster paper on wavelet analysis of the RV Tauri star, U Mon.

In December Cottrell attended a workshop in Sydney to discuss the next generation of astronomical surveys. The meeting focussed on current and future surveys at all wavelengths and the astrophysical questions such surveys might address.

Barnes participated at a conference on large lenses and prisms at the Optical Sciences Laboratory of University College, London in May. He gave there a paper on the design and construction of the Hercules echelle spectrograph at Mt John. He also attended a workshop at Macquarie University in Sydney in April on observational techniques in astronomy, hosted by the Anglo-Australian Observatory.

In November Albrow attended a meeting of the PLANET collaboration in Perth, Western Australia.

5. Southern African Large Telescope

The SALT Foundation (a South African company) has been established through a Shareholder's Agreement by a consortium of institutions to build and operate an 11-m optical telescope in South Africa.

The institutions involved are the South African National Research Foundation, the Hobby-Eberly Telescope Board, Nicolas Copernicus Astronomical Center of the Polish Academy of Sciences, Göttingen University, a consortium of six United Kingdom institutions, Rutgers University, the University of Wisconsin-Madison, Carnegie Mellon University, the University of North Carolina, Dartmouth College and the University of Canterbury. Each shareholding is dependent upon the level of committed funding, which translates into the fraction of telescope time that will be allocated.

Initial capitalization of the project is \$US30 million and the SALT Foundation has a Board of Directors with a maximum of 12 members, one from each of the institutions, except for South Africa which has two. Cottrell is the University of Canterbury's director. The project itself has a Project Manager, Kobus Meiring (to build and commission the telescope) and a Project Scientist, David Buckley (to build and commission an instrument suite for the telescope). Buckley is a BSc and MSc graduate of the department of Physics & Astronomy at the University of Canterbury.

Construction of the telescope commenced in 2001 and much of the shell for the facility had been completed by the end of the year. Some of the significant contracts (primary mirrors, spherical aberration corrector), which are on the critical path to completion, were let. Two instruments are proceeding through the design and construction process stages, namely an imager (called SALTICAM) and an imaging low resolution spectrograph (called PFIS).

Two SALT Board and SALT Science Working Group (SSWG) meetings were held in 2001; one in April near Macdonald Observatory in Texas, and one in October at the University of Wisconsin in Madison. Hearnshaw attended these meetings as project scientist for the SALT high resolution spectrograph at SSWG and as proxy for Cottrell on the Board. In October the decision was taken to defer the design review (scheduled for April 2002) of the fibre-fed high resolution spectrograph, to be designed and built in New Zealand, pending the resolution of funding issues. It is hoped that this will proceed at some time in 2002. Some detailed concept plans for this instrument were developed by Hearnshaw, Barnes and Graeme Kershaw, all from Canterbury. Hearnshaw presented details of the design and its progress to SSWG in April and October.

In connection with the SALT high resolution spectrograph, Hearnshaw visited the Richardson Grating Laboratory and with the firm of Glassfab, both in Rochester, NY in April, and he had discussions with astronomers at the University of California, Santa Cruz in October.

The University of Canterbury is continuing to seek partners for its shareholding, as was outlined at the very beginning of the bidding process for a New Zealand share. Progress has been slow, but there are expectations that some small partners will be found to spread Canterbury's liabilities. Both New Zealand and off-shore partners are being sought.

6. Instrumentation

A highlight for the year at Mt John was the installation of the new high resolution echelle spectrograph known as Hercules (High Efficiency and Resolution Canterbury University Large Echelle Spectrograph). After lab testing in late 2000, Hercules was transported to Mt John in February and had first light from the 1-m McLellan telescope on 3 April 2001. The spectrograph was evacuated to a working pressure of about 2 torr in June and has been maintained at about that pressure ever since. By year's end nearly 2000 stellar spectra had been recorded with the new instrument, mainly for programmes to

measure precise stellar radial velocities. Hercules has been a team effort with John Hearnshaw as P.I., Graeme Kershaw (mechanical design and construction; optical fibres), graduate student Stuart Barnes (optical design, ray tracing and exposure meter), Geoff Graham (control software) and Nigel Frost at Mt John (design and construction of the fibre feed module). Garry Nankivell (Lower Hutt) had in 2000 completed the optical figuring and components were given antireflection coatings or enhanced silver coatings by Laserdyne in Queensland in January and February 2001.

Mt John instruments that continued in service were the medium resolution spectrograph (MRS), the CCD photometer head, the CCD “top hat”, the 3-channel photoelectric photometer (Victoria Univ. Wellington), and two single-channel photoelectric photometers. The Cassegrain échelle spectrograph and the fibre-optic feed (for the échelle spectrograph) were retired from use in March after respectively 24 and 13 years of nearly continuous service at Mt John.

The Photometrics Series 200 CCD camera (SITe 1k x 1k CCD chip with 24-micron pixels) was used throughout the year. The MOA project used MOAcam2, with three butted 2k x 4k SITe CCDs with 15-micron pixels.

7. Other research

This section briefly mentions some other research undertaken within the astronomy group at Canterbury which is not mentioned in other sections of this report, or it expands on some items briefly covered elsewhere.

Cottrell and Duncan Wright (MSc project student) undertook an analysis of a hot hydrogen-deficient star, HD 160641, as part of a collaborative effort with Drs Tony Lynas-Gray (Oxford) and Dave Kilkenny (South African Astronomical Observatory). Spectroscopic and photometric observations obtained at Mt John in 2000 and 2001 were combined with similar observations at other sites to gain some insight into the multiple modes of pulsation that are present in this object.

Bayne (supervisor Tobin) continued work on the eclipsing binary programme at the Mount John using the 1-m telescope and SITe CCD. He obtained photometric data for one eclipsing binary in the LMC and two in the SMC. The SMC binaries are new detections that were found in the MOA database. A light curve analysis on these systems will be undertaken. A paper was submitted to the MNRAS entitled 'The MOA catalogue of eclipsing binary stars in the Small Magellanic Cloud'. This paper contains a catalogue of 167 eclipsing binaries, including 35 new detections, in the SMC.

J. Skuljan has written a software package in C called HRSP (Hercules Reduction Software Package) for the rapid and semi-automatic reduction of Hercules spectra. The implementation of this package was nearing completion at year's end.

Albrow (with collaborators Guido de Marchi and Kailash Sahu from Space Telescope Science Institute) studied the internal structure of the Galactic globular cluster M22. From HST WFPC2 observations of four fields, they derived, for the first time, the spatially resolved mass function of a globular cluster.

Albrow and Pollard continued their research with the PLANET collaboration on photometric and spectroscopic follow-up of microlensing events. For three weeks during 2001, the global network was controlled from Christchurch. Combined data from several years has enabled them to constrain, for the first time, the frequency of Jovian-mass planets orbiting Galactic M dwarfs. No more than one-third of M dwarfs can have such planets orbiting between 1.5 and 4 AU. Analysis of the remarkable binary microlensing event, EROS-2000-BLG-005, has led to the first microlens mass measurement.

Tobin continued to work on his biography of Léon Foucault, which is nearing completion. With Dr James Lequeux (Paris Observatory) he may have discovered Foucault's very first silvered-glass reflecting telescope from 1857.

During the year Tobin worked with Cropp (4th year project student) on the analysis of photometry acquired by Kilmartin and Gilmore of the observationally-difficult eccentric galactic eclipsing binary LY Peg. The system is unusual in that it shows only a single eclipse.

Livingston and Hearnshaw continued working on nova light curves. Together with Gilmore they analysed the light curve of Nova Sagittarii 2001 no. 2 (V4739 Sgr) which appears to be the fastest classical nova ever discovered (decline of two magnitudes in only 0.7 days). Hearnshaw obtained MRS spectra of the peculiar nova-like object Nova Puppis 2000 in January.

8. Marsden grants

Albrow made a successful application in 2001 for a Fast Start Marsden grant to undertake research into planets and binary stars in the globular cluster M22 and the galactic bulge, working with collaborators at the Space telescope Science Institute in Baltimore over a three-year period.

Cottrell, together with colleagues in the Department of Electrical and Electronic Engineering, continued research under a Marsden grant to deal with imaging through turbulence. One aspect of this is to continue the investigation of and possible construction of an adaptive optics module for the 1-m McLellan telescope at Mt John.

The MOA project at Mt John (see section 9) continued to be supported through a Marsden Fund grant to the University of Auckland led by Phil Yock. Sullivan (Victoria), Dodd (Carter, Victoria) and Hearnshaw were also co-investigators for this work. This grant terminated at the end of 2001 after six years of Marsden funding of the MOA project.

9. The MOA project

During 2001 a series of four papers was submitted to the Monthly Notices of the Royal Society on the detection of planets in gravitational microlensing events of high magnification. The first paper by Bond et al described a method for analysing images of large, dense stellar fields rapidly and accurately using an image subtraction technique. This yields a photometric accuracy that is close to the statistical limit dictated by photon statistics, a significant improvement on previously used techniques. The second paper reported analyses of three high magnification events using the image subtraction technique. These yielded the largest exclusion regions yet achieved for Jupiter-like planets orbiting normal stars, including one extra-galactic star. Evidence was also obtained for an Earth-mass extra-solar planet. The third paper reported ten high magnification events that were found by the MOA group during the year using a new observing strategy and on-line image subtraction. These events were suitable for studies of extra-solar planets, and they were reported electronically on a website maintained by Bond for monitoring by existing international follow-up groups. A fourth paper by Rattenbury et al of the University of Auckland reviewed the sensitivity of the the high magnification technique for planet detection. This utilized simulations of gravitational lensing carried out on a cluster computer with 200 processors.

Two further papers were submitted to the Monthly Notices of the Royal Astronomical Society on variable stars and eclipsing binary stars, the former by Noda et al of Nagoya University and the latter in conjunction with Tobin et al of the University of Canterbury.

The optical counterpart of the X-ray transient XTE J1650-500 was discovered by members of the MOA group (Bond, Kilmartin, Gilmore, Petterson) and reported in an IAU telegram.

Preparations were made for future observations using gravitational microlensing. Plans were commenced for the formation of a new network of follow-up telescopes in Australia, South Africa and Chile to monitor future events of high magnification. Also, preparations were made to use existing and planned space-based telescopes. These involve the planned European "Eddington" and the US "GEST" space missions, and the Hubble Space Telescope. Sixty-four orbits of HST time were awarded during 2002 and 2003 for the latter observations.

10. Weather at Mt John (data compiled by Pam Kilmartin)

The weather at Mt John in 2001 was remarkable for its contrasts. We experienced two of the best months in the observatory's history with July being 54% photometric and March 51%. On the other hand both October and December had less than 10% photometric

night-time hours and these poor quality months brought the average for the year to 29%, which is comparable to the average figure of recent years.

Table 1 below compares 2001 weather with that of recent past years, while Table 2 gives a breakdown of 2001 weather month by month. July, March and April (in that order) had the greatest number of photometric hours; in 2000 the best months were July, August and then March.

Table 1: Table of Mt John weather, 1992-2001

Year	Photometric		Partly phot.		Spectroscopic		Unusable	
1992	73	20%	47	13%	80	22%	166	45%
1993	63	17%	61	17%	75	21%	166	45%
1994	66	18%	59	16%	95	26%	145	40%
1995	73	20%	61	17%	105	28%	126	35%
1996	72	20%	77	21%	104	28%	113	31%
1997	79	22%	84	23%	86	24%	116	32%
1998	97	27%	74	21%	71	19%	123	34%
1999	90	25%	43	12%	105	28%	117	32%
2000	66	18%	84	23%	104	28%	112	31%
2001	76	21%	73	20%	109	30%	107	29%

Table 2: Table of usable nights distribution, 2001

Month	Nights fully photometric	Nights fully or partly phot.	Hours photometric	Per cent hours photometric
Jan	8	10	51	27%
Feb	5	12	60	29%
Mar	14	23	151	51%
Apr	9	15	114	36%
May	5	12	92	25%
Jun	5	13	91	23%
Jul	13	22	211	54%
Aug	3	15	84	24%
Sep	8	14	91	30%
Oct	1	5	20	8%
Nov	4	6	35	18%
Dec	1	2	7	5%
Total	76	149	1007	29%

11. Undergraduate programme

(compiled by Saskia Besier)

The academic year 2001 has been a busy one teaching astronomy within the department, particularly with the introduction of a new course ASTR109. Following are a few highlights that some of our undergraduates would have experienced.

ASTR/PHYS109: This is a new course introduced to encourage students from faculties other than science and engineering to do some astronomy. The enrolment size was very encouraging (about 160 students took the class). The course has no lab class and uses no mathematics.

ASTR112: Our standard first year astronomy course had a lower enrolment than in previous years (because of the new ASTR109 course) but the students taking this course were noticeably motivated and keen on pursuing astrophysics. Many of the first year students taking this paper went on to do the second year astronomy paper offered in semester 2, and did very well in both.

ASTR211: This course (along with ASTR212 offered in alternate years) has a solid enrolment of around 30 students. This year keen astronomers were able to learn some astrophotography during some night labs. Using the department's six 20-cm Celestrons, 8 students were able to learn the rudiments of using telescopes and taking photographs of stellar objects, under the supervision of S. Besier..

ASTR/PHYS381: Every year a field trip is organized for undergraduates who are doing the third-year laboratory course. Eight students travelled to Mt John June 1-2 with Besier and worked with the B&C and OC telescopes. Some observing was possible and CCD images were recorded with MOAcam2.

12. Publications

Articles/papers in refereed scholarly journals

Albrow, M., An, J., Beaulieu, J.-P., Caldwell, J. A. R., Dominik, M., Greenhill, J., Hill, K., Kane, S., Martin, R., Menzies, J., Pollard, K., Sackett, P. D., Sahu, K. C., Vermaak, P., Watson, R., Williams, A., Hauschildt, P. H., H-alpha Equivalent Width Variations across the Face of a Microlensed K Giant in the Galactic Bulge, *Astrophysical Journal*, v550, 2001; 173-17

Albrow, M. D., An, J., Beaulieu, J.-P., Caldwell, J. A. R., DePoy, D. L., Dominik, M., Gaudi, B. S., Gould, A., Greenhill, J., Hill, K., Kane, S., Martin, R., Menzies, J., Pogge, R. W., Pollard, K. R., Sackett, P. D., Sahu, K. C., Vermaak, P., Watson, R., Williams, A.,

PLANET Observations of Microlensing Event OGLE-1999-BUL-23: Limb-darkening Measurement of the Source Star, *Astrophysical Journal*, v549, 2001; 759-769

Albrow, M.D., Gilliland, R.L., Brown, T.M., Edmonds, P.D., Guhathakurta, P., Sarajedini, A., 2001, The Frequency of Binary Stars in the Core of 47 Tucanae, *Astrophysical Journal*, v559, 1060-1081

Bond, I.A., Abe, F., Dodd, R.J., Hearnshaw, J.B., Honda, M., Jugaku, J., Kilmartin, P.M., Marles, A., Masuda, K., Matsubara, Y., Muraki, Y., Nakamura, T., Nankivell, G., Noda, S., Noguchi, C., Ohnishi, K., Rattenbury, N.J., Reid, M., Saito, To., Sato, H., Sekiguchi, M., Skuljan, J., Sullivan, D.J., Sumi, T., Takeuti, M., Watase, Y., Wilkinson, S., Yamada, R., Yanagisawa, T., Yock, P.C.M., Real-time difference imaging analysis of MOA galactic bulge observations during 2000. *Mon. Not. R. astron. Soc.*, 327, 2001: 868--880.

Herbig, G.H., Aspin, C., Gilmore A.C., Imhoff, C.L., Jones, A.F., The 1993-94 Activity of EX Lupi, *Publ. Astron. Soc. Pacific*, 113, 2001: 1547-1553.

Yan Tse, J., Hearnshaw, J.B., Rosenzweig, P., Guzman, E., Escalona, O., Gilmore, A.C., Kilmartin, P.M. and Watson, L.C., An analysis of the spectra and light curve of Nova Centauri 1995. *Mon. Not. R. astron. Soc.* 324, 2001: 553-559.

Papers published in refereed conference proceedings

Hearnshaw, J.B., Critical factors for a successful astronomical research program in a developing country. In *Astronomy for developing countries*, ed. A.H.Batten, presented at IAU General Assembly special session, Manchester, UK, Aug. 2000, *Astron. Soc. of the Pacific Conf. Series*, IAU SPS, 2001: 15 -- 28.

Hearnshaw, J.B., Photographic stellar photometry in the late nineteenth and early twentieth centuries. In *Homage to Miklos Konkoly Thege: A collection of papers on the history of astrophysics*. Ed. by C. Sterken and J.B. Hearnshaw. Free University of Brussels, 2001: 159 – 169

Rattenbury, N., Bond, I., Skuljan, J., Yock, P., in "Small Telescope Astronomy on Global Scales", eds. W.P.Chen, C. Lemme, B. Paczynski, *ASP Conf. Ser.*, 246, 2001: 72-82.

Sullivan, D.J. The Whole Earth Telescope Collaboration, 12th European Workshop on White Dwarf Stars, *ASP Conference Series* 226, 2001: 417-419.

Books edited

Sterken, C. & Hearnshaw, J.B., eds. *Homage to Miklos Konkoly Thege: 100 years of observational astronomy and astrophysics*. Publ. by C. Sterken, Vrije Universiteit Brussel 2001: pp. xii+268.

Papers in unrefereed journals and data in astronomical circulars

Gilmore, A.C. Thirty-four astrometric observations of nine comets, 549 observations of 100 near-Earth asteroids, and 161 observations of 38 other asteroids. *Minor Planet Electronic Circ.* 2001: C02, C18, C22, D45, E2, E24, E28, F14, F36, F40, K23, N36, N35, O06, O07, O37, Q20, S43, S69, S76, T44, T47, T48, T49, U08, W41, X55, X62, X63, X64, X67, Y02 2001; *Minor Planet Circulars* 42033, 42258, 42456, 42754, 43116, 43268, 43459, 43848 2001; *IAU Circ.* 7774, 2001.

Gilmore, A.C. & Kilmartin, P.M., Photometry of Nova Puppis 2000, Novae Sagittarii 2001 No. 2 and No.3, and observations of remnant of comet C/2000 W1 (Utsunomiya-Jones). *IAU Circ.* 7559, 7569, 7594, 7692, 7695, 7698, 7702, 7709, 7713, 7719, 2001.

Hearnshaw, J.B. Astronomy in the Department of Physics and Astronomy and at Mt John University Observatory, annual report 2000. *Southern Stars* 40, 2001: 22-26.

Livingston, C.M., Hearnshaw, J.B., Gilmore, A.C. & Kilmartin, P.M., Nova Sgr 2001 No. 2 = V4739 Sgr *Inf. Bull. Variable Stars*, 5172, 2001: 1-4.